A PROJECT SYNOPSIS ON

Exploring the Prospective of Parthenium Hysterophorus for Biogas Production through Cow Dung, Poultry Manure and Goat Manure

SCHOOL OF CIVIL ENGINEERING

Submitted by:

Name	Email.id	Cell no.
D. Lakshmi Deepak	deepak.depuri@gmail.com	9100032977
C.V. Siva Kumar	sivakumar1lucky@gmail.com	7075629372
CH. Asish Reddy	asishreddy619@gmail.com	9966033959
Charan G	maaricharan2000@gmail.com	7349354191

Under the guidance of

Prof. Pavitha M P

Assistant Professor

School of Civil Engineering

CONTENTS

SL NO.	CONTENTS	PAGE NO.
1.	INTRODUCTION	3
2.	OBJECTIVES	4
3.	METHODOLOGY	5-10
4.	RESULTS AND CONCLUSIONS	11-13
5.	SCOPE FOR FURTHER WORK	13
6.	REFERENCES	14

1. INTRODUCTION

One of the main and important factor for daily and smooth movement of our daily life activities include using of oil, coal, natural gases etc. which are fossil fuels. Starting from vehicles for transport to cooking amenities use fossil fuels in a huge scale. This results in declining of levels of fossil fuels as above mentioned are non-renewable. So, as a solution for this declining fossil fuels, various alternate methods are thought of and are bought into usage. One of these alternative methods is usage of biofuel, biogas, biodiesel etc. This not only reduces usage of fossil fuels, but also helps in producing biogas which is generally produced with less economy.

The main theme of our project is to know the usage of parthenium weed plant in the production of biogas and reducing of usage of fossil fuels by making a mixture of parthenium and different manures.

The aim of this study was to obtain the optimal Mix ratio for biogas production from anaerobic digestion of Parthenium and three different manures. The experiment was batch operated and gas yield will be observed regularly for 35 days. The parameters that are considered are Total Solids (TS), Total Volatile Solids (VS), and Moisture content. Five digesters are employed with different mix proportions naming Digester-1 with 100 % manure, Digester-2 with 75 % manure and 25 % parthenium, Digester-3 with 50 % manure and 50 % parthenium, Digester-4 with 25 % manure and 75 % parthenium, Digester-5 with 100 % parthenium. The gas production rate was measured daily by using Displacement method.
At the end of this experiment we can find out the characteristics of samples that is used and helps in comparing the outcomes. It gives an overview on how the sample is and how much the moisture content is in the sample and how it affects the overall outcome.

2. OBJECTIVES

The objectives of study are:

- To know the potential of Parthenium Hysterophorus and to produce Biogas & finding characteristics of different manure.

- To find out and select optimum mix proportion of Parthenium Hysterophorus and three different manures for Biogas production.

- To compare different optimum mix proportions with Parthenium Hysterophorus for Biogas production.

- To produce a clean and renewable form of energy as a sustainable for conventional sources of energy.

3. METHODOLOGY

3.1 MATERIALS

I. PARTHENIUM HYSTEROPORUS

Fig 1: Parthenium Hysterophorus

Fig 2: Parthenium (Grinded)

Table 1: characteristics of Parthenium Hysterophorus

CHARACTERISTIC	DESCRIPTION
Plant Height	Typically grows 0.5 to 2 meters tall
Stem	Erect, branched, and hairy
Leaves	Fern-like, alternate, and deeply lobed with serrated edges
Flowers	Small and white, with 5 petals and feathery bracts
Seeds	Small, light brown, and oblong in shape
Density	500-550 seeds per gram
pH	Tolerates a wide range of soil pH (4.5-9.0)
Soil Texture	Tolerates a range of soil textures from sandy to clayey
Nutrient Requirements	Grows in low fertility soils, but can respond to fertilization
Allelopathy	Releases chemicals that inhibit the growth of other plants
Secondary Metabolites	Produces compounds such as parthenin, which can cause allergic reactions in humans and livestock
Water Use	Tolerates drought conditions and can grow in areas with low rainfall
Life Cycle	Annual or perennial, depending on environmental conditions

II. GOAT MANURE

Fig 3: Goat Manure

Table 2: characteristics of Goat Manure

CHARACTERISTIC	DESCRIPTION
Moisture Content	50-70%
Nitrogen Content	1.7-2.4%
Carbon to Nitrogen Ratio	15-25:1
pH	6.5-7.5
Solubility	Moderately Soluble
Decomposition Rate	Moderate
Odour	Mild to Moderate
Pathogens	Low risk, but can carry E.coli and salmonella
Weed Seeds	Low risk, but can contain weed seeds
Trace Elements	Contains higher levels of trace elements such as copper, zinc, and iron
Water Holding Capacity	Has a high water holding capacity and can help improve soil structure
Fertilizer Value	Is a good source of nitrogen, phosphorus, and potassium, and can provide a slow-release source of nutrients

III. POULTRY MANURE

Fig 4: Poultry Manure

Table 3: characteristics of Poultry Manure

CHARACTERISTIC	DESCRIPTION
Moisture Content	60-75%
Nitrogen Content	3.0-3.5%
Carbon to Nitrogen Ratio	7-12:1
pH	6.5-8.0
Solubility	Highly Soluble
Decomposition Rate	Rapid
Odour	Strong and Pungent
Pathogens	High risk of carrying pathogens such as E.coli and salmonella
Weed Seeds	High risk of containing weed seeds
Trace Elements	Can contain high levels of trace elements, such as arsenic, which can be toxic to plants and animals in large amounts
Water Holding Capacity	Has a lower water holding capacity than cow dung or goat manure, but can still improve soil structure
Fertilizer Value	Has high levels of nitrogen, phosphorus, and potassium, and can be a valuable source of micronutrients and organic matter

IV. COW DUNG

Fig 5: Cow Dung

Table 4: characteristics of Goat Manure

CHARACTERISTIC	DESCRIPTION
Moisture Content	70-80%
Nitrogen Content	2.0-3.0%
Carbon to Nitrogen Ratio	20-30:1
pH	6.5-7.5
Solubility	Moderately Soluble
Decomposition Rate	Slow
Odour	Mild to Moderate
Pathogens	Low risk, but can carry pathogens such as E.coli and salmonella
Weed Seeds	Low risk, but can contain weed seeds
Trace Elements	Contains lower levels of trace elements than goat manure, but can still be a valuable source of micronutrients
Water Holding Capacity	Has a moderate water holding capacity and can improve soil structure
Fertilizer Value	Is a good source of nitrogen, phosphorus, and potassium, and can help improve soil fertility

3.2 METHODOLOGY

- **STEP 1** :- Study characteristics of Parthenium Hysterophorus and 3 different manures.

  Some characteristics to be considered for the above materials are:

  - ✓ Total Solids (TS)
  - ✓ Total Volatile Solids (VS)
  - ✓ Moisture Content(MC)
  - ✓ pH value
  - ✓ Physical Appearance

- **STEP 2** :- Arrangement of digestors (setup of 3 bottles contaning slurry, brine solution and an empty container that receives brine solution that was expelled).

  - ✓ The biogas that is produced from the first bottle (slurry) is slowly moved to second bottle (brine solution).
  - ✓ By displacement method, the solution from second bottle is then pressured to move to third empty bottle.
  - ✓ The amount of solution that is accumulated in the third bottle is equivalent to the biogas produced from that particular setup.

- **STEP 3** :- Preparing the different proportions of materials taken (Parthenium Hysterophorus & 3 different manures).

  Five different proportions for Goat Manure given below:

  - ➢ Proportion 1:- 100% Goat Manure
  - ➢ Proportion 2:- 75% Goat Manure + 25% Parthenium Hysterophorus
  - ➢ Proportion 3:- 50% Goat Manure + 50% Parthenium Hysterophorus
  - ➢ Proportion 4:- 25% Goat Manure + 75% Parthenium Hysterophorus
  - ➢ Proportion 5:- 100% Parthenium Hysterophorus

Five different proportions for Poultry Manure given below:

- Proportion 1:- 100% Poultry Manure
- Proportion 2:- 75% Poultry Manure + 25% Parthenium Hysterophorus
- Proportion 3:- 50% Poultry Manure + 50% Parthenium Hysterophorus
- Proportion 4:- 25% Poultry Manure + 75% Parthenium Hysterophorus
- Proportion 5:- 100% Parthenium Hysterophorus

Five different proportions for Cow Dung given below:

- Proportion 1:- 100% Cow Dung
- Proportion 2:- 75% Cow Dung + 25% Parthenium Hysterophorus
- Proportion 3:- 50% Cow Dung + 50% Parthenium Hysterophorus
- Proportion 4:- 25% Cow Dung + 75% Parthenium Hysterophorus
- Proportion 5:- 100% Parthenium Hysterophorus

✓ The optimum mix proportion is decided on the biogas accumulated from the above five.

- **STEP 4** :- Conduction of anerobic digestion in batch mode (Lab experimenting).

✓ This experiment need to be strictly anaerobic.
✓ After the sample is mixed and kept in incubator, it should be not removed or exposed to air until the end of its time period.

- **STEP 5** :- Samples are checked at regular intervals for noting.

- The samples are checked on daily/weekly basis to note and observe the changes that are happened in the mean time period.

- **STEP 6** :- Comparative Analysis / Result Analysis.
  - Finally, the results are compared and checked at the end of the incubation period for finding the optimum mix proportion among the five proportions.

4. RESULTS AND CONCLUSIONS

4.1 RESULTS

Table 5: Results of calculations Initial Characteristics of Goat Manure

SAMPLE	TOTAL SOLIDS (TS) [mg/lit]	VOLATILE SOLIDS (VS) [mg/lit]	MOISTURE CONTENT (MC %)
Sample 1	1100	1400	8.3
Sample 2	1000	1250	13.04
Sample 3	900	1100	14.2
Sample 4	850	950	22
Sample 5	600	600	52

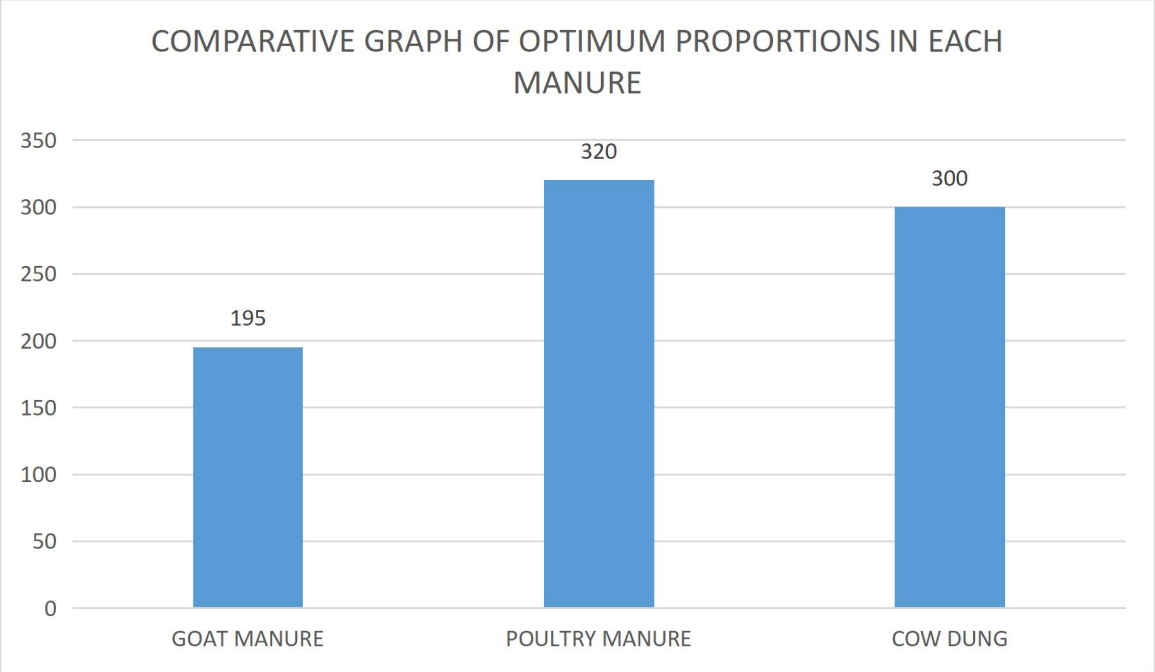
Table 6: Results of calculations Initial Characteristics of Poultry Manure

SAMPLE	TOTAL SOLIDS (TS) [mg/lit]	VOLATILE SOLIDS (VS) [mg/lit]	MOISTURE CONTENT (MC %)
Sample 1	1150	1450	12
Sample 2	1250	1450	4.1
Sample 3	1000	1300	4.34
Sample 4	900	1100	21.7
Sample 5	750	850	22.7

Table 7: Results of calculations Initial Characteristics of Cow Dung

SAMPLE	TOTAL SOLIDS (TS) [mg/lit]	VOLATILE SOLIDS (VS) [mg/lit]	MOISTURE CONTENT (MC %)
Sample 1	1400	1600	4
Sample 2	1250	1550	12
Sample 3	1150	1500	13.04
Sample 4	1000	1100	9.5

Sample 5	800	900	34.7



Graph 1: Comparative Graph of Optimum Proportions of Each Manure

- From the Comparative Graph, we can understand the comparison between each manure and optimum mix proportion of each manure.
- Goat Manure has a 78% Biogas produced from the amount of Brine solution used.
- Similarly, Poultry Manure has 80% & Cow Dung has 75% produced.

4.2 CONCLUSION

We expect to learn more on this methods and by experimenting on different proportions.

- To produce Biogas from mixture of Parthenium Hysterophorus and with goat manure.

- Efficient and economical ways of producing Biogas with use of bio degradable waste.

- The results of previously conducted experiments and journals show that, the digester with mix proportions produce more biogas than that of the digester with one single material.

- By using different manures and different proportions of parthenium, we can identify and make use of the optimum proportion and it can be used in real time.

- These type of digesters can be used in real time with appropriate amounts to produce biogas in more quantity and ultimately used in reducing fossil fuel usage.

5. SCOPE FOR FUTURE WORK

Energy experts claim that compressed biogas could become the fuel of the future due to its virtue of being a clean and renewable source of energy, which is also indigenous. It is also expected to reduce the cost of imports of natural gas.

The future scope for projects involving biogas production from a mixture of parthenium and manures like cow dung, poultry manure, and goat manure is very promising. Parthenium is a highly invasive weed that is difficult to control. It is also a noxious weed that can cause health problems in humans and animals. Biogas production from parthenium can help to reduce the environmental impact of this weed and provide a renewable source of energy.

There are several advantages to using a mixture of parthenium and manures for biogas production. Parthenium is a high-energy crop that can be grown in a variety of climates. It is also a relatively inexpensive crop to grow. Manure is a good source of nutrients for the anaerobic digestion process. The combination of parthenium and manures can produce a high yield of biogas.

Biogas can be used for a variety of purposes, including cooking, heating, and generating electricity. It is a clean and renewable source of energy that can help to reduce greenhouse gas emissions. Biogas production from parthenium and manures can also help to create jobs and stimulate the local economy.

6. REFERENCES

1. Getu Hailu, Wolkite University and Meseret Chimdessa Egigu, Haramaya University, 2020. “Anaerobic Digestion of Parthenium Weed with Goat Manure to Generate Biogas Energy”.
2. Meseret Chimdessa Egigu, Haramaya University, 2014. “Production of biogas from Parthenium Hysteroporus co-digestion with poultry manure”.
3. Anumbreen Tayyab and Zulfiqar Ahmad, 2019. “Anaerobic co-digestion of catering food waste utilizing Parthenium hysterophorus as co-substrate for biogas production”.
4. Dr. V Nallathumbi Gunaseelan, 1987. “Influence of Potash on Biogas Production from Cow Dung and Food Waste”.
5. Anoop Yadav, Central University of Haryana and V.K. Garg, Central University of Punjab, 2016.” Vermiconversion of biogas plant slurry and parthenium weed mixture to manure”.
6. Ify Lawrence Nwaogazie, University of Port Harcourt.” Influence of Potash on Biogas Production from Cow Dung and Food Waste”.